Engineer and Surveyor.

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MEETINGS OF CITY AND TOWN BOARDS.

The Board of Public Works of the City of Chicago is in session from 10 to 12 A. M., and from 2 to 4 P. M., every day, at the City Hall, S. E. cor. of Adams and La Salle streets. Parties presenting plats of subdivisions for approval, will leave them with Otto Peltzer, Chief Draughtsman

The Office of the West Chicago Park Commissioners is at No. 25 South Halsted street, and plats for approval may be presented any day between 9 A. M. and 4 P. M. Chas. S. Loding, Secretary.

The Trustees of the Village of Hyde Park meet at the Town Hall in Hyde Park every Saturday, at 3 P. M., where plats may be presented, or they may be left with Chas. S. Pope, Village Clerk, at Room 16, Kent's Building, 153 Monroe st., before 11.30 A. M. Saturday. Plats approved by the Hyde Park Council are retained for record. Hyde Park train leaves at 3 P. M.

The Board of Trustees of the Town of Lake meets at the Town Hall, at the Stock yards, every Monday, from 9 A. M. to 4 P. M.

The Board of Trustees of the Town of Jefferson meets at Jefferson Village on the first Saturday of each month. Plats may be left with S. M. Davis, 43 Bryan Block.

The Trustees of the Town of Cicero meet at the Town Hall in Austin, at 8 A. M., on the second Monday and last Saturday of the month.

Secretaries of the different Boards will do us a favor if they will inform us of any changes that may from time to time be made in the meetings or regulations of their several Boards.

DIRECTORY.

Academy of Sciences—No. 263 Wabash Avenue. Meets second Tuesday of every month, at 7.30 P. M.

Historical Society—209 Michigan Avenue. Dr. Bryeson, Librarian.

Civil Engineers' Club of the Northwest—Meets at the rooms of the Academy of Sciences, the first Monday of each month. E. S. Chesbrough, Pres. L. P. Morehouse, Sec'y.

Free Library—S. E. cor. Wabash avenue and Madison street. Open from 9 A. M. to 9 P. M.

Chicago Chapter of the American Institute of Architects—145 Clark st., Rooms 52 and 53. Meetings, first and third Thursday of each month. President, W. W. Boyington; Vice President, P. B. Wight; Secretary, C. C. Miller; Treasurer, Jas. R. Willett.

PROSPECTUS.

Of the learned professions, the only one in this country unrepresented by a journal devoted exclusively to its interests, is that of the Civil Engineer and Land Surveyor.

In Law, Medicine and Theology, every school, and every shade of sect and opinion has its exponent which records its progress from year to year and faithfully notes each new development. In Civil Engineering there is an American Eclectic Journal, and several Foreign Periodicals, but these are high in price and addressed only to a few of the mostadvanced in the profession. To fill the vacancy now existing in the Engineering literature of the country, "The Engineer and Surveyor" is sent forth, and it will be the aim of the publisher to make it a Journal well worthy of the noble profession which it proposes to represent.

Some of the subjects to be considered will be:

Theoretical and Practical Surveying.
The United States Land System.
The Survey, and Sanitary Improvement of Towns, Cities and Villages.
The Survey and Construction of Roads, Railroads, and Canals, and the improvement of Lakes and Rivers.
Hydraulic and Mining Engineering.
The Reclamation, Drainage and Irrigation of land.
Mechanical Engineering.
Maps and Map Drawing.
Technical Education.

Besides this list, there will be given well digested reviews of the Real Estate, Iron and Coal trades; the reports of scientific societies, Supreme Court decisions in contested surveys; selections from scientific journals, American and Foreign, notices of the latest scientific publications, and such other matter as may be of interest to every surveyor, civil engineer, land owner, or general reader.

Arrangements are now being made to secure correspondents in every State in the Union and in Europe, and to obtain the most accurate and reliable descriptions of important Surveying and Engineering operations.

"The Engineer and Surveyor" invites the profession to use it as a medium of communication between themselves and the public, and hopes by such mutual intercourse to promote the welfare of themselves and contribute materially to the public weal.

We propose to publish during the year, several valuable maps and will endeavor to fully illustrate the most important articles.

"The Engineer and Surveyor" will be printed in octavo form on paper 24x36 inches, and will be issued monthly, at Two Dollars per annum, payable, in all cases, in advance.

GEO. H. FROST,
Editor and Proprietor,
145 Clark Street, Room 29.

Railway Spikes.—The railway spike most commonly used is 5½ inches long, 9-16 square, and weighs about ½ pound. The spikes are usually sold in kegs of 150 lbs. A mile of single track road, with 2,700 cross ties, (this number includes turnouts, etc.), will require 10,800 spikes, or 5,400 pounds, or 36 kegs of 150 pounds. Trautwine says 10,000 spikes, or 33½ kegs per mile, single track road, but he allows for placing ties 2½ feet apart from center to center; this distance can be used with safety in the east, on hard soil, but not in the west on our alluvial formations, where ties are usually placed two feet apart.

Entered according to Act of Congress, in the Year 1874, by George H. Frost, in the Office of the Librarian of Congress, at Washington.

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POLLUTION OF WATER.

Owing to the vast amount of land in this country still uninhabited, and the numerous rivers and streams that flow through it, there is not much difficulty (except perhaps in some of our most populous Eastern States,) in obtaining a supply of *pure* water for any required purpose near any specified locality.

In the old settled and densely populated countries of Europe this is not so, and for some years past, in Great Britain especially, the subject of purifying their rivers and streams, which have been greatly polluted by the refuse of cities, towns and villages, with their numerous factories and chemical works, has occupied the attention of the legislators of the country, and parliamentary and royal commissioners have at various times been appointed to take evidence thereon. Consequent upon this evidence, bills have been introduced and passed through parliament having for their object, if not a thorough at least a partial purification of their rivers, as much in fact, as could be effected without interfering in too great a degree with vested interests or the often quoted "liberties of the subject."

From the Report of the Royal Commissioners, composed of Sir William Denison, Dr. Frankland and Mr. Morton, which sat, we think, in 1867–8, we take the following observations concerning liquids, which the Commissioners considered to be "polluting and inadmissible into any stream."

(*a*). Any liquid containing in suspension more than three parts by weight of dry mineral matter, or one part by weight of dry organic matter in 100,000 parts by weight of the liquid. (*b*). Any liquid containing in solution more than two parts by weight of organic carbon, or three parts by weight of organic nitrogen in 100,000 parts by weight. (*c*). Any liquid which shall exhibit by day light a distinct color, when a stratum one inch deep is placed in a white porcelain or earthen ware vessel. (*d*). Any liquid which contains in solution in 100,000 parts by weight more than two parts by weight, of any metal, except calcium, magnesium, potassium and sodium. (These four metals in their protoxide form,—that is—combined with one equivalent of oxygen gas, are lime, magnesia, potash, and soda, and are thus the health giving qualities of very many of our mineral springs and waters). (*e*). Any liquid which in 100,000 parts by weight contains, whether in solution or suspension, in chemical combination or otherwise, more than one-twentieth part by weight of metallic arsenic. (*f*). Any liquid which after acidification with sulphuric acid contains in 100,000 parts by weight, more than one part by weight of free chlorine, (a gas which though not actually poisonous is of a very irritating and suffocating character). (*g*). Any liquid which contains in 100,000 parts by weight, more than one part by weight of sulphur, in the condition either of sulphuretted hydrogen, or a soluble sulphuret. (Sulphuretted hydrogen is the essential gas in the odor arising from rotten eggs, etc., and is poisonous to the lower animals, even when mixed with 1000 times its own volume of air. It is very offensive even when mixed with 10,000 times its volume of air; water will contain 2½ times its volume of sulphuric acid). (*h*). Any liquid possessing an acidity greater than that which is produced by adding two parts by weight of pure hydrochloric acid to 1000 parts by weight of distilled water. (*i*). Any liquid an alkalinity greater than that produced by adding one part by weight of dry caustic soda to 1000 parts by weight of distilled water.

The above observations are taken (with the exception of the parenthetical remarks) from that portion of the report that refers to the basins of the Mersey and Ribble rivers, but are distinctly stated to be considered applicable to *all* rivers and streams. The Mersey drains the southern portion, and the Ribble the northern portion of the county of Lancaster or Lancashire in England, and on the former and its tributaries, are situated the city of Manchester, the towns of Liverpool, Warrington and many other large manufacturing towns, and it receives besides the sewage discharge from these towns, the refuse from all the cotton and chemical factories, etc., of which there are very many. The latter river, besides the sewage from the large towns of Preston and Blackburn, receives the refuse of cotton and flax factories established all through the country districts of this, one of the largest and busiest manufacturing and mining counties of England.

C. J. M.

"HOW TO OBSERVE."

These three words might serve as a motto to guide us in the most important part of our early education —a part, unfortunately, only too much neglected. All the natural sciences are particularly valuable, not only as supplying the mind with the most rich, various, and beautiful furniture, but as teaching the people that most beautiful of all arts, how to use their eyes. It is astonishing how much we all go about with our eyes open, and yet seeing nothing. This is because the organ of vision, like other organs, requires training; and by lack of training and the slavish dependence on books, becomes dull and slow, and ultimately incapable of exercising its natural function. Let those studies, therefore, both in school and college, be regarded as primary, that teach young persons to know what they are seeing, and to see what they otherwise would fail to see. Among the most useful are, Botany, Zoology, Mineralogy, Geology, Chemistry, Architecture, Drawing, and the Fine Arts. How many excursions and continental tours have been rendered comparatively useless to young persons well drilled in their books, merely from the want of a little elementary knowledge in these sciences of observation.

IMPROVEMENT OF THE DESERT OF THE COLORADO RIVER.

The Senate Committee on Public Lands, on the motion of Senator Jones, were recently ordered to report on the expediency of surveying the great desert lying in that portion of the West where the State of California and Territories of Nevada and Arizona all join. Senator Jones has already had a survey made at his own expense, which shows the tract to be some 300 miles long, and of a width varying from 60 to 100 miles, its general surface being from 100 to 300 feet *below* sea level. The great Colorado River of the West flows through one portion of this district, and the Senator's proposition is to lead off the waters of the same, through a canal passing up one of the side canons of the Colorado and submerge the whole desert, thereby forming a vast inland sea greater in its dimensions even, than the Great Salt Lake, and then, owing to the presence of this large body of water, the climate would change from its present condition of scorching summer heats and mild, dry winters, to one more equable and of frequent rainfalls, and the country adjoining its banks would become fit for settlement. Of course the stream entering the lake must be conducted through it and back into the Colorado River channel, otherwise the lake being stagnant, would speedily resume the alkaline characteristics of the Great Salt Lake, and the country round would thus be but very little benefited. As the Colorado is at present navigable for some hundreds of miles for light draught steamers up to Callville in Nevada, this plan, if carried out, would seriously impair, during construction, the navigation of the river; but we do not agree with the correspondent of one of the New York dailies, when he says, that owing to the evaporation from so large a body of water, and the necessity of maintaining a *flowing* stream through it, the whole volume of the Colorado river would be required for these purposes. He instances the case of the Great Salt Lake as an example, in which he says, the evaporation is such "that it "takes the supplies of three goodly rivers and some "smaller streams to maintain the volume of the lake." Upon referring to any accurate map (such as those published by the Government) it will be seen that although only partially explored as yet, the basin of the Great Colorado river and branches is incomparably greater than that of all the streams and rivers which flow into the Great Salt Lake of Utah, and it is reasonable to suppose that Senator Jones' scheme could be carried out with none other than a temporary inconvenience and stoppage of the navigation.

The alternative scheme and so-called improvement mentioned by the correspondent above alluded to is to let in the waters of the Gulf of California by a canal leading from its head to the desert. Instead of being cheaper, this would be a much more expensive plan than the other, owing to the greater length of canal that would be required, and the difficulties to be met with on the line. Would not this salt inland sea again speedily become stagnant, in spite of any efforts which might be made to induce a current through it? and then wherein would the climate and surrounding country be benefited when the new sea was of the same character as that in Utah or in Palestine?

JAMES RIVER AND KANAWHA CANAL.

Gen. A. A. Humphreys, chief of the U. S. Engineers, in submitting a copy of the report of the Board of Engineers, constituted by order of the Secretary of War to examine and report upon the James River & Kanawha Canal project, says the character and object of the work has been so ably presented and discussed by the Board, he has nothing to add further than to express his concurrence in their conclusions, which are as follows:

First.—That it is entirely practicable to connect the waters of the James and Ohio Rivers by water navigation of 7 feet in depth. The tunnel that will be required would be about the length of the Mount Cenis tunnel, but it would go through rock very easily excavated, and could be driven from shafts of moderate height, and at distances seldom exceeding one mile.

Secondly—That an ample water-supply can be commanded.

Thirdly—That the tunnel should be a single tunnel, with turn-outs provided in sufficient number to admit of vessels passing.

Fourthly—That the proposed water-line can be completed in six years and not exceeding $60,000,000, and that the cost may reasonably be expected to be within $55,000,000, and may possibly not exceed $50,000,000.

Lastly—That, in the opinion of the Board, this route presents extraordinary claims as a measure of relief to the population of Western States in furnishing them for their bulky productions, cheap transportation to market, and for fostering the commerce of the United States by developing immense mineral resources now neglected.

PROFESSIONAL READING.

The merely professional man is always a narrow man; worse than that, he is an artificial man, a creature of technicalities and specialties, removed equally from the broad truth of nature and from the healthy influence of human converse. In society the most accomplished man of mere professional skill is often a nullity; he has sunk his humanity in his dexterity; he is a leather-dealer, and can talk about nothing but leather; a student, and smells fustily of books, as an inveterate smoker does of tobacco. So far from rushing hastily into merely professional studies, a young man should rather be anxious to avoid the engrossing influence of what is popularly called the

SHOP. He will soon enough learn to know the cramping influence of purely professional occupation. Let him flap his wing lustily in an ampler region while he may;

"Der Jungling sold die Flugel regen
In Lieb und Hass gewaltig sich bewegen."

But if a man will fix his mind on merely professional study, and can find no room for general culture in his soul, let him be told that no professional studies, however complete, can teach a man the whole of his profession; that the most exact professional drill will omit to teach him the most interesting and the most important part of his own busines—that part, namely, where the specialty of the profession comes directly into contact with the generality of human notions and human sympathies. Of this the profession of the law furnishes an excellent example: for, while there is no art more technical, more artificial, and more removed from a fellow-feeling of humanity, than law in many of its branches, in others it marches out in the grand arena of human rights and liberties, and deals with large questions, in the handling of which it is often of more consequence that a pleader should be a complete man than that he should be an expert lawyer. In the same way, medicine has as much to do with a knowledge of human nature and of the human soul as with the virtues of cunningly mingled drugs, and the revelations of a technical diagnosis; and theology is generally then least human and least evangelical when it is most stifly orthodox and most nicely professional. Universal experience, accordingly, has proved that the general scholar, however apparently inferior at the first start, will, in the long run, beat the special man on his own favorite ground; for the special man, from the small field of his habitual survey, can neither know the principles on which his practice rests, nor the relation of his own particular art to general human interests and general human intelligence. The best preservatives against the cramping force of merely professional study are to be found in the healthy influence of society, in travel, and in cultivating a familiarity with the great writers —specially poets and historians—whose purely human thoughts "make rich the blood of the world," and enlarge the platform of sympathetic intelligence.—*Selected.*

FINDING LATITUDE AT SEA.

Commonly the seaman trusts to observation of the sun to give him his latitude. The observation is made at noon, when the sun is highest above the horizon. The actual height is determined by means of a sextant. This instrument need not be here described; but this much may be mentioned to explain the process of taking the sun's meridian altitude. The sextant is so devised that the observer can see two objects at once, one directly, and the other after reflection of its light; and the amount by which he has to move a certain bar carrying the reflecting arrangement, in order to bring the two objects into view in the same direction, shows him the real divergence of lines drawn from his eye to the two objects. To take the sun's altitude with this instrument, the observer takes the sun as one object, and the horizon just below the sun as the other; he brings them in view together, and then, looking at the sextant to see how much he has had to move the swinging arm which carries the reflecting glasses, he learns how high the sun is. This being done at noon, with proper arrangements to insure that the greatest height then reached by the sun is observed, at once indicates the latitude of the observer. Suppose, for example, he finds the sun to be 40° above the horizon, and the *Nautical Almanac* tells him that at the time the sun is 10° north of the celestial equator, then he knows that the celestial equator is 30° above the southern horizon. The pole of the heavens is, therefore, 60° above the northern horizon, and the voyager is in 60° north latitude. Of course, in all ordinary cases, the number of degrees is not exact, as we have here for simplicity supposed, and there are some niceties of observation which would have to be taken into account in real work. The principle of the method is sufficiently indicated, and no useful purpose could be served by considering minutiæ.

HOW TO SUBDIVIDE LAND IN ILLINOIS.—Take to any competent surveyor, the exact description of your land, together with a sketch of how you wish to have it platted. He will suggest what changes, if any are necessary, to make it a legal subdivision, as well as the most profitable one. It is then surveyed and the lots staked out on the ground according to the plat. The surveyor furnishes his client with a plat for record drawn to a convenient scale, showing the dimensions and numbers of all blocks and lots, the width of all streets and alleys, and the location of any river, lake, &c., that may be upon the tract; describing the subdivision in a caption, and more fully describing the tract surveyed in his certificate which he gives with every plat for record. The subdivision must then be acknowledged by the *owner* before a *Justice of the Peace in the County* in which the subdivision is. If it is in the city of Chicago it must be approved by the Board of Public Works, and if it is within 400 feet of any of the West Chicago Parks or Boulevards it must be approved by the Park Commissioners. If in any Township having a town organization, it must be approved by the Board of Trustees of that town. Having passed these several "Boards" it is ready for record. The surveyor can generally plat the land so that there need be no difficulty or delay in getting it ready for the recorder.

RAIL MANUFACTURERS' MEETING.—The Western Rail Mill Association met at Columbus, Ohio, April 8th. All mills west of Pittsburg were represented—thirty-one in number. The object of the meeting, whatever it was, was not accomplished, there not being a majority present. Reports from various sources show that nearly all the mills represented are idle. Receipts from western railways had fallen off 25 per cent. below the corresponding month of last year, and few orders on hand. Parties of thirty-five years' experience say they never before saw such stagnation in the business of manufacturing rails. The Association adjourned to meet at Chicago in June next.

THE HOOSAC TUNNEL is approaching completion; the operations of the contractors now being practically confined to the western end and section. Between the east and the central shaft only 20 men are now employed in clearing out the loose rock remaining in the bottom. In this section it only remains to construct the central drain and to lay the permanent track. Between the tunnel portal and the railroad station, a distance of about 4,500 feet—the road bed is about ready to receive the ballast,

IRRIGATION.

The subject of irrigation is one which has engaged the attention of the large majority of the inhabited world ever since man has existed upon the earth. In almost all countries we find remains of extensive works, many of which are of an age stretching far back into the remote regions of antiquity. It is supposed by some that the art of irrigation was first practiced in Egypt, where the annual overflow of the Nile necessitated the adoption of some means by which to distribute the invaluable gift of water to the most advantage; but inasmuch as we have abundant evidence of irrigation works in China, Hindostan, and Media-Persia fully as ancient as those previously better known in Egypt, it is more reasonable to suppose that irrigation was known to the whole human family prior to the confusion of tongues, and the consequent separation and division of the race at the attempted building of the Tower of Babel. Perhaps when the western portions of our own country are more fully explored, (we allude chiefly to Arizona and parts of New Mexico, Nevada, and California), remains of irrigation works will be discovered more ancient yet than any found elsewhere, and by which the diligent archæologist may be able to prove the existence of man upon this continent at a time coeval with that in which we find the earliest history of the oldest inhabited countries of the world.

We propose, in the following series of articles, to consider the subject of irrigation historically, descriptively, and practically, using as few technical terms as possible—only so many, in fact, as may be necessary to place the subject clearly before our readers. It is not proposed to treat our subject exhaustively, for we have not space at command; and if we had, the numerous excellent books published on irrigation (to which we shall refer from time to time) preclude the necessity. We only hope to give such description as may interest all our readers, and in the concluding portions of the articles such practical directions as may enable any farmer who owns his half or quarter section in our western States and territories to lay down his own irrigation works to the best advantage.

Besides the extensive works in Hindostan, Europe, and Egypt, we expect to be able to give an accurate description of those works which have been carried out in our own country, in California, Colorado, and other places, which, we believe, will be the first detailed and collective description yet published. Where necessary, also, our articles will be fully illustrated with carefully executed drawings.

Owing, also, to the fearful famine now raging in Bengal through the failure of the rice crop, drought, and, alas! also through insufficient means of irrigation, the attention of the civilized world is being concentrated on that portion of the globe, and renders the subject of irrigation one of peculiar and increasing interest.

One of the first references to irrigation, we find, is in one of Moses' many exhortations to the children of Israel while making that wonderful journey through the desert. Some 1,450 years B. C., he promised them that the land they were journeying to should be one which, on account of its hills, valleys, springs, and streams, should not need irrigation, as did Egypt in which "they sowed their seed and watered it with their feet, as a garden of herbs;" alluding to the practice still in use of training the water over the ground by raising small, temporary dams of earth with the foot. The earliest travelers allude to, or give account of, the immense artificial lakes, or storage reservoirs or canals, all made in ancient times for the purpose of irrigation, many of which may still serve as lessons to our own engineers. In Egypt, the immense artificial lakes lying between the Mediterranean and the Red Seas, (three of which are now traversed by the Suez Canal), were all formed for the purposes of irrigation, and were supplied from the Nile at its annual rising by canals of considerable number and size. These lakes, Mœris, Nitroeris, Behira, and Mareotis, are fully described in some French works, as are also the canals, which are said to be some eighty in number, and of lengths varying from 60 to 100 miles.

The Nile commences to rise in June, attaining its maximum height of from 24 to 28 feet in the middle of August, and inundates the valley of Egypt for twelve miles in width. The other principal rivers of the world which annually rise and inundate the surrounding country, are the Ganges, Euphrates, and the Mississippi. On all these rivers, save the last named, are found extensive irrigation canals of ancient date, many of which still lead the waters of inundation far into the country on either side of the rivers, some conveying it for immediate use, others to large reservoirs or lakes in which the surplus is stored for use as the seasons may demand, until the next years' flood. The Ganges rises thirty-two feet between April and August, and then floods the country for a width of one hundred miles. The Euphrates rises twelve feet between March and June, and inundates its far-famed valley where once proud Babylon, with its hanging gardens, and prosperous Nineveh, cultivated all the land around them. The Mississippi rises from March until June, and often increases ten feet in depth during its flood time, with the assistance of the "mighty Missouri" and its numerous tributaries. As the valley proper of the Mississippi is of considerable width, the flood waters are kept out by long lines of levees or embankments, which will be described hereafter, and thus immense tracts of rich alluvial soil is saved for the use of the cotton planter.

It is a rather curious fact that the two great conquests of the world, the Macedonian and the Roman, destroyed for a long time the bold and successful practice of the art of irrigation, which had been carried on by the engineers of the kings of Egypt, Assyria, and India, and through the neglect of the conquerers many of the finest works were allowed to fall to ruins and the state of decay in which we now see them—the aqueducts being in many cases mistaken by the conquerors for fortifications, and thus purposely destroyed. Thus when the Roman Empire was finally destroyed by the northern tribes and the Saracens, many large districts which before the Macedonian conquest had been richly cultivated were by that time again become deserts and sandy wastes. These barbarous tribes then revived the neglected arts of irrigation, and the Goths in Germany, Belgium, France, and Italy, the Moors in Spain, the Saracens in eastern Europe and western Asia, and the West Saxons in England, established those systems which are in successful use at the present time, the credit of which is sometimes unfortunately given to their subsequent conquerors, that is, to the French, Spaniards, and Italians.

Coming now to our own country, as has already been stated, we find remains of very extensive works in Arizona, New and Old Mexico. These are not, as has often been supposed, the works of the Spaniards or their their descendants, but of the ancient Mexican race, or Aztecs, and their ancestors and predecessors. The Spaniards, upon invading this portion of the continent, were greatly surprised to find a system of irrigation much more complete and perfect than their own, and the Franciscan monks, in their proselyting zeal, penetrating far into the recesses of the country, have left accounts even yet extant of the high degree of art and civilization which prevailed among the inhabitants, of whom the only lineal descendants are now the Pueblos, Pimas, Mariposas, and one or two other kindred tribes, who, though converted by the Franciscan monks and professing Christianity, still preserve in secret to this day the worship of the sun and the perpetual fire in his honor. The murderous and treacherous Apache, then as now, was the cause of the numerous ruins the traveller beholds, and until he be exterminated, or at least governed by the strong yet just arm of the military, we can hope but little for the repopulation of our Territory of Arizona, the soil of which only needs careful irrigation again resumed, to equal in productiveness that in any part of our vast country.

Irrigation may be divided generally into two classes—the natural and the artificial. The first of these consists of rain, irrigation from wells, and the inundations of flooded rivers; and here the art of the engineer consists in training into its proper channels, conserving and utilizing in the most economical manner, the water which nature places at his disposal. The second class consists of irrigation by canals and tanks, in the construction of which and their appendages the highest art and ingenuity has been shown.

Canals, again, are subdivided into two classes—those for irrigation alone, and those for irrigation and navigation combined—the latter of which is specially applicable to large districts where the construction of railroads would be too expensive until trade and population is developed.

Our present knowledge of the interior of China being but very limited, we do not know if there exist in that country any large tanks or reservoirs for irrigation purposes, but their canals are many, and the water is mostly raised from such, and from the streams and rivers, by an ingenious bucketed wheel hereafter to be described. In Hindostan we have the greatest modern development of the two branches of irrigation by canals and reservoirs. The irrigation by canals is again distinctly different in northern and southern India; or, by political divisions, in Bengal in the north, and Madras in the south. This arises from the different character of the respective portions of the country.

C. J. M.

THE IMPORTANCE OF THE ART OF SURVEYING.

Ever since the days when the Egyptian farmers, following the receding waters of the Nile, sought to restore the boundaries of their annually submerged fields, the art of Surveying, or Land Measuring, has been an important factor in contributing to the comfort and convenience of mankind. And when Pharaoh, exchanging his seven years' accumulation of corn, for land, became the owner of all Egypt, we may well suppose that the services of the surveyor were in demand, and that under the royal patronage extended to him during succeeding centuries, the art itself was greatly advanced and became the prolific mother of many others.

It was introduced into Europe by Thales about 600 B. C., and soon became so necessary to the proper administration of the every day business of life, that some of the most celebrated philosophers and mathematicians of antiquity gave their attention to the study of its principles and the improvement of its practice, and to their labors the world has ever since been indebted.

Surveyors are still engaged in measuring and mapping the earth's surface. Year after year, and century after century, the work has progressed, until, from unknown boundaries, the ancient world, has been resolved into exact outlines of continents, islands, oceans, seas, lakes, and rivers that constitute the globe on which we live.

The Continents have been divided into States and these again into lesser divisions, until among civilized nations each individual may have the boundaries of his landed possessions defined with certainty, and claim protection from the State against all invasion of his rights thereon.

The oceans also have been explored, and each hidden shoal, sunken rock, and shifting sandbar, have been so accurately determined as to position and extent of surface, that the mariner as he guides his ship across the trackless waters, has but to consult his charts and follow the paths there marked out for him, to pursue his voyage in safety.

We leave for future consideration the different branches of surveying, the character of some of which we have thus briefly noticed. Our purpose now is to call attention to the great importance of the science itself, and the necessity that those who practice its principles should be men of intelligence, sound judgment, unswerving integrity, and animated with a desire to elevate their noble calling to its proper rank among the learned professions, and by their own qualifications show themselves worthy to be the arbiters between their fellow men in the settlement of just claims upon the soil.

Are the Surveyors of these United States men of this class?

CITY WATER PIPES.

Air valves are no longer used in city pipes, their places being supplied by fireplugs at average distances of about 150 yards apart. These, being placed as much as possible at the summits of undulations in the lines of pipes, for convenience of washing the streets, and being frequently opened for that purpose, permit also the escape of accumulated air. The escape of compressed air through an air valve or other opening has been known to produce bursting of the pipes, for the escape is instantaneous and allows the water in the pipes on both sides to rush together with great force, so as to check each other and react against the pipes.

The quantity of water required by cities has been found by experience to increase faster than the population. About sixty gallons, or eight cubic feet, per day to each inhabitant, is usually considered a fair, ample allowance. Many European cities do have half as much, while New York and some other cities use and waste half as much more. With efficient means for preventing waste, sixty gallons will probably suffice for any commercial city. Inasmuch as cleanliness and health are promoted by its free use, as few restrictions as possible should be introduced.

In fixing upon the diameters of pipes for supplying cities, it is necessary to bear in mind that by far the greater portion of the twenty-four hours' yield is actually drawn from them during only eight to twelve hours of daylight; therefore the capacity of the pipes must be sufficient to furnish the daily supply in much less than twenty-four hours. Again, during the hot, summer months, more water is used than in the winter months, and this consideration necessitates a still larger diameter. There are no practical rules for determining the diameter of pipes for supplying cities. The various complications involved make such matters entirely empirical. At least, no city street pipe should ever be laid of a diameter less than six inches.

Mains which cross each other should be connected at some of their intersections, to allow the water a more free circulation throughout the entire system; so that if the supply is cut off temporarily at any point from one direction by closing of valves for repairs, or is diminished by excessive demand, the volume of water may be maintained by the flow from other directions.

BURNT MAPS.

HOW THEY SHOULD BE RESTORED—OPINION OF THE CIRCUIT COURT JUDGES ON STATE'S ATTORNEY REED'S GENERAL SUIT TO INCLUDE ALL CASES.

The following opinion of the Judges of the Circuit Court in banc was rendered by Judge Tree yesterday. State's Attorney Reed had commenced a suit to include the restoration of all the burnt maps or plats of Cook County. The matter was brought before the judges, and the following is their decision:

Application of C. H. Reed, State's Attorney, to reproduce maps, etc.

An Act of the General Assembly entitled "An act to remedy the evils consequent upon the destruction of any public records by fire or otherwise," approved April 9, 1872.

The fourth section of the act provides that whenever the public record of any plat or map which is required by law to be kept by the Recorder of Deeds, has been, or may hereafter be injured or destroyed by fire or otherwise, it shall be the duty of the State's Attorney of the county in which such loss has occured to file an information in the Circuit Court in the name of the people, setting forth the fact of such injury or loss, with the circumstances, and thereupon the clerk of the court shall cause such information to be published in full in such county for the period of four weeks, together with a notice to "all whom it may concern" that the court will, at a term therein designated to be held, proceed to determine the matters in said information set forth, and will take testimony for the purpose of reproducing and re-establishing such records of maps and plats as may be injured or destroyed; that upon such publication being made,

all persons interested shall be deemed defendants, and may appear in person or by counsel, and be heard touching such proceedings. That if the court shall be satisfied that any public record of maps and plats has been injured or destroyed, an order to that effect shall be entered of record, and thereupon the court shall proceed to take testimony for the purpose of re-establishing the record destroyed. The proceeding may be continued from time to time, whether in term or not, and orders and decrees shall be made as to each plat or map separately.

All maps and plats adjudged by the court to be correct copies of the maps injured or destroyed shall be recorded in the office of the recorder of deeds with a certified copy of the order of the court upon the premises, attached thereto, and said copies shall thereafter be taken as true and correct reproduction of the original public record injured or destroyed.

That the clerk shall cause all maps and plats adjudged by the court to be correct copies of the records injured or destroyed as often and as soon as they are so adjudged, to be recorded in the office of the recorder of deeds, with a certified copy of the order or judgment of the court in the premises attached thereto, and recorded in a book provided for the purpose; and the record shall be deemed and taken in all courts and places as a public record, and as a true and correct reproduction of the original record injured or destroyed.

In pursuance of this act the State's Attorney filed an information December 13, 1873, setting forth that on October 9, 1871, there were on record in the office of the Recorder of Deeds in Cook County, divers maps and plats relating to certain real estate situated in said county; that on said October 9, all of said maps and plats were destroyed by fire; and that the number and description are unknown to the informant, therefore he cannot more particularly describe and set forth the same.

There was also filed in this case, on January 22, 1874, a notice, with the proper certificates of publication of four weeks. The notice sets forth that the State's Attorney had filed an information December 13, 1873, and that at the following January term the court would proceed to hear and determine the matters set forth, and would take testimony for the purpose of reproducing all maps and plats destroyed, and make such orders as might be necessary in the premises.

Under the information and notice thus filed, it was sought at the February term of court to offer evidence of the destruction, and to procure an order for the restoration of a certain map claimed to have been destroyed by fire of October 9, 1871.

Upon consideration, the court was satisfied that both the information and notice were insufficient to authorize the entry of an order for the re-establishment of any map or plat thereunder.

The information fails to describe any particular map or maps relative to which testimony is to be taken with a view of re-establishing the same; and the notice is equally silent in this respect. It is true that there is an averment that the number and descriptions of the maps destroyed, and which he seeks to restore are unknown to the informant, but do not regard this averment as furnishing a sufficient excuse for the failure to allege the specific maps intended to be restored. The statute clearly contemplates that all persons interested in the map to be restored, shall be notified of the proceeding, in order that they may be present at the taking of testimony and the hearing of the application. Four week's notice in a daily newspaper is required, but of what use is such notice if no particular maps are described? The court was also of the opinion that the proofs of the map or maps destroyed should be taken in the form of depositions before a proper officer, in order that they may be preserved on record, and in all cases hereafter such proofs will be required. To these conclusions all the members of the court agreed and in this case the application was therefore denied.

THE NEW ILLINOIS LAW, RELATING TO PLATS.

SECTION 1. *Be it enacted by the People of the State of Illinois, represented in the General Assembly:* Whenever the owner of lands shall wish to subdivide the same into two or more parts for the purpose of laying out a town, or making any addition to any city, village or town, or of re-subdividing any lots or blocks therein, he shall cause the same to be surveyed and a plat thereof to be made by the county surveyor, or some other competent surveyor, which plat shall particularly describe and set forth all the streets, alleys, common or public grounds, and all the in and out lots or fractional lots and blocks within, adjoining or adjacent to the land so divided, giving the names, width, courses and extent of all such streets and alleys, and numbering all lots and blocks by progressive numbers, giving their precise length and width. Reference shall also be made upon the plat to some known and permanent monuments from which future surveys may be made, or, if no such monuments shall exist within convenient distance, the surveyor shall, at the time of making his survey, plant and fix in such manner that the same shall not be moved by frost, at the corners of some public grounds, or, if there be none, then at the corners of some lots or blocks most convenient for reference, good and sufficient stones, to be furnished by the person for whom the survey is made, and designate upon the plat the point where the same may be found.

§ 2. The plat having been completed, shall be certified by the surveyor and acknowledged by the owner of the land or his attorney, duly authorized, in the same manner as deeds of land are required to be acknowledged. The certificate of the surveyor and of acknowledgment, together with the plat, shall be recorded in the recorder's office of the county in which the land is situated, and such acknowledgment and record shall have like effect, and certified copies thereof and of such plat or of any plat heretofore acknowledged and certified according to law, may be used in evidence to the same extent and with like effect as in case of deeds.

§ 3. The acknowledgment and recording of such plat shall be held in law and in equity to be a conveyance in fee simple of such portions of the premises platted as are marked or noted on such plat as donated or granted to the public, or any person, religious society, corporation or body politic, and as a general warranty against the donor, his heirs and representatives to such donee or grantee for their use or for the use and purposes therein named or intended, and for no other use or purpose. And the premises intended for any street, alley, way, common or other public use in any city, village or town, or addition thereto, shall be held in the corporate name thereof in trust to and for the uses and purposes set forth or intended.

§ 4. Whoever shall lay out any town or make any addition to any city, village or town, or re-subdivide any lots or blocks therein, and neglect to plant any corner stone, when required by this act, or shall survey the same or cause it to be surveyed in any other manner than that which is prescribed in this act, shall be fined in any sum not less than twenty five nor exceeding one hundred dollars.

§ 5. Whoever shall sell or offer for sale, or ease for any time exceeding five years any lot or block in any town, city or village, or any addition thereto, or any re-subdivision of any lot or block therein, before all the requisitions of this act have been complied with, shall be fined twenty-five dollars for each lot or block or part thereof so disposed of, offered for sale or leased.

CHICAGO & SOUTHERN RY. CO.

This Company filed articles of association with the Secretary of State at Springfield, Ill., April 7. The capital stock is $250,000; the principal officers reside in Chicago. The proposed route runs from the south to a point on the Chicago, Danville & Vincennes Railroad, not yet determined.

THE ENGINEER AND SURVEYOR.

CHICAGO, ILL., APRIL 15, 1874.

A MONTHLY JOURNAL OF PRACTICAL ENGINEERING SURVEYING, MECHANICS, HYDRAULICS, MINERALOGY, METALLURGY, AND KINDRED SCIENCES.

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All communications relating to THE ENGINEER AND SURVEYOR should be addressed to GEO. H. FROST, Editor and Proprietor, 145 So. Clark st., Room 29, CHICAGO, ILL.

W. F. GOODHUE, Assistant Editor

CHAS. J. MOORE, C. E., New York Editor and Eastern Business Manager, 52 Broadway, Room 29,

It is, perhaps, easier to define what engineering does not, rather than what it does, include. Even the oldest of all occupations—that of tilling the ground—requires the use of various implements which, in their present forms, are the practical results of mechanical engineering. The arts of draining and irrigating the soil, are, in their best practice, the business of the hydraulic engineer, in whose repertory, sanitary engineering, or the drainage and sewerage of cities, is rapidly making a separate place for itself. Canals, railroads, mines, metallurgy, and manufactures, are all works in which the various branches of engineering are employed.

Now, the tendency of the present age is toward centralization; a specialty, from meaning *favoritism*, is rapidly coming to signify *exclusiveness;* and in this strong individualizing of the separate departments of a business or profession, there is a danger of those who devote themselves to any one branch thereof becoming careless and neglectful of the progress that is being made in the others. Thus, an engineer is suddenly called upon to practice in some branch of the science which is not his specialty. Hurriedly he furbishes up his early knowledge of the subject, but the modifications in the practice in that particular branch between "now" and "then" have become so numerous that he is soon painfully reminded of the fact that he is "behind the age." But how is he to prevent the recurrence of a similar *contretemps?* He cannot buy and read all the scientific publications of the day, and he knows of no single journal to which he can refer for information in the several branches of his profession. In view of this fact, the publisher of this journal thought that an American organ representing the interests of all the branches of the profession in a greater or less degree would have a fair prospect of success. In England there are already two such journals, one of which, *Engineering*, a most excellent paper, stands at the head of all the professional journals; but they are too high in price, and at times too abstruse in tone to command the constant attention of the majority of our American profession. In this country we have no *general* engineering paper (except, perhaps, Van Nostrand's Eclectic Magazine), and our present issue is the commencement of an attempt to supply a want in this direction long felt, though not, perhaps, expressed. We earnestly call, therefore, upon each and all of the engineers in the country to help us to make this journal of value to themselves and to the public generally; and to further this, a portion of its columns will always be open for free communication on points of general interest.

We hope eventually to raise the paper to a standing in this country such as *Engineering* and *The Engineer* occupy in England, and no effort on our part will be spared to effect it. Fundamental laws and scientific truths will be stated in as simple language as possible, and all rules and formulæ will be explained when necessary. We hope to keep our readers acquainted with all that is going forward in the engineering world, both at home and abroad, and we trust they will, from time to time, assist us by sending such reliable information on points of engineering interest as may fall under their notice, and thus, by creating a personal interest in the paper, help to insure its success.

Hoping our present commencement will speedily eventuate in a truly *national* engineering paper, we commend ourselves to our readers.

TO WESTERN CITY ENGINEERS.

Throughout the west there are many towns adopting those improvements which distinguish the metropolis from the rural city. The city engineer is often called upon to furnish plans and estimates for pavements, sewerage, etc., which he is not prepared to give, and not always through ignorance or lack of knowledge, but from want of practice and the unusual character of the work,—circumstances necessarily forced upon him—as is the case in all new localities where city improvements never existed. The citizens of any town soon learn the advantages of improvements and conveniences adopted by the municipal authorities for the public good, and in most cases the opinion of one city in regard to the benefits derived from innovations—such, for instance, as the Holly system of waterworks, the Nicholson and other pavements, gas, sewerage, etc.—governs neighboring cities in the adoption of such improvements. Chicago furnishes a good opportunity for study and practice of this kind of work, more so, probably, than any other city in the west. Indeed, there are few kinds of pavement worthy of mention which this city has not tested and proved the utility of, and the same might be said of other street improvements.

The average city engineer has a hard berth, as we know from experience. Whenever the city authorities desire anything in his line, he is requested to appear before them, and he must talk about this or that improvement as learnedly as a sage, and without a moment's forethought or preparation. If he hesitates and fails to rally his long-disused talents concerning a certain class of work, his capacity and skill is questioned, and the authorities consider that their city has outgrown the ability of its engineer, and the first so-called engineer who comes along and says he knows a gas main from a drain pipe, supersedes him. But when a legal question arises, the corporation counsel is called upon, and if he fails to collect his ideas sufficiently to give a prompt answer, he merely looks wise at the committee and bows them out with the remark that "so momentous a question requires considerable reflection," and the committee withdraw, profoundly impressed with his ability.

The intelligent engineer is usually well posted in the sanitary and beneficent requirements of cities, yet the details necessary to construct and perfect these improvements are not accessible to everyone, and it is the purpose of THE ENGINEER AND SURVEYOR to assist him in every way practicable, and to further this purpose we invite correspondence upon any of the subjects of which this paper treats, and we will publish limited answers in the column devoted to "Correspondents."

Whenever it is necessary to reply by mail, or we are requested to furnish drawings to fully represent a detail, we shall charge a moderate sum, enough to cover the cost of drawing and time employed in preparing such written information.

THE OUTLOOK.

That our paper supplies a real want in the community is evidenced by the many letters and subscriptions which we have been receiving daily, in response to our advertising circular. Most of the public land States, and several of the Eastern, are represented in our list, and we feel that our estimate of the wants and appreciation of the profession was a just one.

So auspicious a beginning encourages us in our undertaking, and we can safely assure our friends that we will make THE ENGINEER AND SURVEYOR one of the most welcome acquaintances they possess. Our present number is the result of our first attempt at engineering in a printing office, and we can hardly suppose that it will satisfy *all* of our friends. Our field of exploration is a large one, and cannot all be staked out at once; but we promise our readers that as our survey progresses, and we "open out" some old line or "run" a new one; as we get the outlines of a new field of investigation, or settle the boundaries of an old one, we will open to them a most interesting country, in which, as they progress, they will ever be discovering new regions of delight; for our profession is a most noble one, the study of which should be a pleasure to every person in it, while it is so intimately connected with the every day wants of modern civilization that its principles and practice popularly set forth must necessarily interest every man who is himself interested in the well being of his fellows.

The present number of THE ENGINEER AND SURVEYOR cannot fail to please those who may read it. In the next number we will take up more fully the subject of practical Surveying, and our public land system, which will hereafter be prominent features of the paper. Trusting in the continued hearty support of our friends we submit our first notes for their inspection and approval.

THE Astronomical Society met Friday evening, April 17th, at the rooms of the Academy of Science. We regret that we have no space to devote to a report of the proceedings.

CLUB RATES.—To Engineering and Scientific Students attending college, we will give a discount on subscriptions of ten per cent. Ten copies for one year, $18.00, mailed to any college in the United States. To Canadian colleges we give the same rates, with cost of postage additional.

A PERSONAL ACKNOWLEDGMENT.

The Surveyors of Illinois should ever feel under grateful obligations to Mr. Otto Peltzer, member of the Illinois State Legislature, also Mr. S. S. Greeley, City Surveyor of Chicago, and to Mr. J. M. Bowen, of Springfield, Ills., for their untiring efforts and success in defeating the recent "Surveyors Bill" in the Legislature, thus allowing the competent surveyor to practice his profession in this State, without let or hindrance of the law. Mr. Peltzer is the principal draughtsman of the Board of Public Works, and in performing the multifarious duties of the office, he has given marked proof of his tact and ability. The derangement of the public records—reference being had to that portion consisting of maps, plats, etc., which were injured or destroyed by fire—was a serious drawback to the landed interests of the citizens of Chicago. In restoring these records, Mr. Peltzer has achieved signal success and the people can now make use of his perfected work without fear of entailing upon themselves and their heirs endless litigation. The wants aud needs of the growing city of Chicago, causes never ceasing changes in her corporate domain and the careful and systematic manner in which the work is done is the result of Mr. Peltzer's able supervision.

REVIEW OF THE NEW YORK IRON MARKET

FOR THE QUARTER ENDING MARCH 31.

[Special Correspondence.]

The iron trade opened this year in a very dull state in all its branches, varying in dullness only in slight degree, and it has kept in the same condition for the past three months. In American pig, the year opened with a slight business, which declined however, as the weeks advanced, until, owing to the strikes which took place in the Lehigh district, fear of strikes, and general uneasiness due to uncertain knowledge of the intended action of Congress in regard to the currency question, business became almost *nil*. Makers refused to make contracts until they knew how the great financial question would be settled; but now that the inflation bill has been passed by Congress, the iron trade shows signs of more activity, and we may look for a revival therein. Scotch pig has been mostly kept in store by the importers, as the prices offered were much below the amounts expected to be realized by a revived business. Uneasiness abroad, however, owing to the condition of one or two large houses in the trade, has caused the prices to decline during the last few weeks. American bar opened firm, and continued so for a few weeks; prices then declined somewhat, but rose again since, as railroad buyers came into market, Welsh rails opened the year with a little business, prices being higher than toward the close of last year, but business falling off has caused many of the later

quotations to be merely nominal. American rails opened at higher prices than have since been maintained, but some business has been done therein nearly all through the quarter. Old rails also have fallen during the quarter from the prices with which they opened the year; in some weeks no business at all was done in them. No. 1 scrap has been maintaining pretty good prices throughout the quarter.

Prices for Week ending	*Apl.* 1	*Apl.* 13
Foundry No. 1	$.....	$.....
Foundry No. 2,	35@36	34@35
Gray's Forge,	32@33	31@33
White and Mottled,	29@30	27@30
Scotch Pig,	.....	22@26
Gartsherrie,	.....	.....
Coltness,	40@41	39@40
Glengarnock,	39@40	37@39
Eglinton,	37@	36@37
American Bar,	3c@3.3	3c@3.2
Welch Rails,	$59gold	$54@58
American Rails,	59@60	58@60
Old Rails,	40@41	40@41
Scrap Iron,	41@	.....

Now that the currency question may be considered settled, trade will revive, and prospects ahead are more hopeful, although the settlement for inflation is adverse to the interests of iron importers. *C. J. M.*

NARROW GAUGE RAILWAYS.

Undoubtedly the narrow gauge will henceforth be the pioneer system of railways in America. Had this system been known and adopted twenty-five years ago, when Illinois, Wisconsin, and other Western States, were rapidly doffing their primitive garb and asuming the robes of self-government and civilization, the railways of to-day would stand better financially, they would have cost less, earned the same amount of money in the meantime and spent less, consequently they would owe less and cheap transportation would be a fact and not a clamor. The construction of a narrow gauge road does not prevent its being a standard gauge in the future. In this country exists the singular fact that a population does not create railways; on the contrary the railways create the population. Upon this principle we penetrate a new country with a narrow gauge road, emigration follows it, towns spring up along the route, the farming country becomes largely developed, and in ten years the road is enjoying a remunerative traffic which did not exist when the iron was first laid. By this time the company must expend largely in renewals; ties, iron, bridges and rolling stock are nearly worn out, and if the business of the road demands it, why not change the guage? Buy heavier rolling stock and iron, widen the embankment and make a standard guage road. The company will be in far better circumstances to effect this change than if they built the standard gauge at the outset; their original investment was smaller and they had a business and trade to create, the former an advantage which is desirable in all new enterprises, and the latter a stimulant to success.

THE ENGINEER AND SURVEYOR recognizes no antagonism between the narrow and the standard gauge system of railways. The wheelbarrow, the farm wagon, and the four horse omnibus all have their uses; the former could not successfully run in opposition to the latter. A narrow gauge road would not be successful were it built contiguous to and run in competition with any one of our east and west trunk lines, but on the table lands of Dakota or Texas, and in the valleys of the Rocky mountains, it would cost less to build, it would earn the same amount of money and pay larger dividends than the standard gauge. The three narrow gauge roads now in operation in North America fully demonstrate all we have said of the narrow gauge systems. Neither one system or the other requires a greater or less amount of engineering skill to construct them. The shoemaker who makes a pair of men's boots should be able to make a pair for a boy. In either case his success is evidence of his skill and workmanship.

IRON ORE.

[COAL AND IRON RECORD CONDENSED.]

Looking at the iron territory of the United States from a geographical standpoint, and with reference to the commerce and business of the country, we find it divided into four great territorial divisions, namely: First that portion which borders on the Atlantic sea shore; second, that of the valley of the Mississppi and its tributaries; third, that of the valley of the St. Lawrence; and fourth, that of the western slope of the Rocky Mountains and the Pacific coast.

With the exception of the ore of New England, the Atlantic division is very regular, and seems to conform to a well defined system. The deposits of iron, using this word in a general sense, within this district lie in a series of parallel groups, comformable to the coast line and the trend of the Alleghany mountains, stretching southwestward from the Housatonic river, in Connecticut, to the Alabama river, in Alabama.

If in this latitude we travel inland in a line at right angles to the sea shore, we shall first encounter the bog ore (limonite) of the low lands bordering the sea coast; second, the hematite of Staten Island, reposing on serpentine; third, the magnetic ores of New Jersey, lying in several parallel groups; fourth, the hematites of New Jersey, reposing on limestone, which is the limit of the ore bearing region on the northwest in New Jersey. These latter hematites have come down on both sides of the Taconic mountains from Vermont, through Massachusetts and Connecticut, and crossed the Hudson into New Jersey.

If we travel inland from the Chesapeake Bay, we shall encounter the same series of ores, and at Montour, Pa., we shall find another variety of ore, known as the argillaceous oxide, fossiliferous ore, or dyestone ore. We shall also find two more varieties—the hematites, or Devonian of Prof. Rogers, or of those rocks which immediately underlie the carboniferous formation of Pennsylvania, and the carbonates and hem-

atites, siderite, and sphero-siderites of the coal formation.

If we make a similar journey inland from the coast of North Carolina, we shall find the same series, but many times repeated. The reason of these repetitions arises from the folding of the rocks which hold these ores upon themselves, their upheaval, and the subsequent erosion of the arches of their folds. Owing to these causes operating southward with greater intensity than northward, we have a fanlike expansion of ore-bearing rocks—the handle of the fan resting on the North river. The handle is but forty miles wide, while the expanded fan across North Carolina and Virginia is more than three hundred miles wide. It is over one thousand miles in length, measuring northwestward and southwestward.

Beyond all comparison it is the most magnificent exhibition of iron ore known to civilized man. No other country has such an expanse of ore; whether we look at the quality of the material, the variety of its different beds, the richness of the ore in metal, as well as quantity, it stands unrivaled on the face of the globe. Within its bounds are mines which have been worked over a hundred years. There are many veins that can show a breadth of over one hundred feet. In the extreme south, we read of Red mountain surpassing all other iron deposits. The iron mountains of Missouri, Michigan and the Adirondacs united cannot equal it if the descriptions given of it are correct. It is said to be 150 miles long, and capped with a bed of fossilliferous ore twenty feet in thickness. If the inquisitive traveler should start at Salisbury, in Connecticut, and terminate his journey at Selma, Alabama, he would never be out of the immediate neighborhood of an iron ore mine.

When we consider that this iron territory is every few miles cut through by running streams, many of which are navigable, that it is every where intersected by well constructed country roads, that the sound of the steam whistle of locomotives echoes from one to the other, throughout its whole extent; that within its borders lie vast forests of virgin timber, that within the bowels of its mountains are hidden untold millions of tons of mineral fuel, ranging from the anthracite to grahamite, and when we reflect that there is not wanting within its limits a single element of success, can we not prophecy that here shall ever be the center of the great iron manufacturing interests of the growing future? May we not be justly proud of the mineral wealth lying at our very doors? Within these limits lie every variety of ore that is needed in our economical pursuits, ores that will make the hard white pig, ores that will make the easy flowing metal for delicate castings, non-phosphorus for Bessemer steel, and manganiferous ores for tempering other ores. Within the Atlantic division lie 80 per cent. of all the furnaces, forges, bloomeries and rolling mills of the United States. Probably this rate will continue for another decade, and perhaps more.

A SIMPLE RULE.

For computing the number of tons of iron rails required per mile of road:

Multiply the weight per yard of rail by eleven, and divide the result by seven. For example: How many tons of iron rail required per mile, weight of rail 56 pounds per yard? 56x11=616 divided by 7=88 tons per mile.

ARTESIAN WELLS, WYOMING DESERT.

[IRON AGE—CONDENSED.]

Owing to the frequent break downs of the water trains on the Union Pacific Railway, through pipes freezing and bursting, it became necessary to provide some other means of obtaining the water required for locomotives, stations, mines, etc. Artesian wells were resorted to last year, and with gratifying results. Six wells were sunk which yielded water, and a seventh is in progress. These are at Separation, 724 miles from Omaha; Creston, 738 miles; Washakie, 753 miles; one in progress at Red Desert, 760 miles one at Bitter Creek, 784 miles; Point of Rocks, 804 miles; and Rock Springs, 832 miles. Creston is situated on the Continental Divide, or the "Backbone of the Continent." At Separation, the well is 1103 feet deep, and passes through several veins of good coal. The water comes up to within ten feet of the surface, and by pumping yields 2,000 gallons per hour. At Creston the well is 326 feet deep, and yields an ample supply of water. At Washakie the well is 638 feet deep, and at a height of fifteen feet above the surface of the ground yields 800 gallons per hour. This well, at a depth of 97 feet, passes through a vein of coal six inches thick; at 250 feet, through a bed of hematite ore twelve feet thick, supposed to be part of the deposit which crops out at Rawlins. Washakie is some 470 feet above Rawlins. At Bitter Creek the well is 696 feet deep, and at the surface flows at the rate of 1000 gallons per hour, but yields by pumping 2,160 gallons. The veins of coal passed through are quite thin. At Point of Rocks the well is 1000 feet deep. The water only rises to within seventeen feet of the surface, being raised farther by pumping, but the supply is abundant, and the quality of water is the best of all the wells. The coal veins passed through are very slight. At Rock Springs the depth reached was 1,145 feet, and the water rises to twenty-six feet above, discharging 571 gallons per hour; at the surface the discharge is 960 gallons. Several veins of coal were passed through, of 11, 6, 5 feet, and less—total thicknesses, 90 feet. This well was sunk through layers of clay mixed with sandy loam, clear sand and pebbles (in which water supply is usually found), layers of sandstone of varying hardness, beds of iron and sulphate of alumina chemically combined, which resembles the bluish clay of some of the surface soil. All these layers are formed by detritus deposited by the action of water, and are underlaid partly by the bituminous shale which appears at the surface fifteen miles west of Rock Springs and at Green River. In this vicinity it rises in bluffs and hillocks of considerable height.

This general description of stratification is common to all the wells. The looseness of the soil caused much delay in boring, as the sides caved in, and consequently cast-iron tubing was used for a greater portion of the depth. The bore of each well is six inches. The quality of the water in the various wells is not all that could be wished, as it contains too many alkaline salts, which upon using in locomotive boilers are deposited and form a crust therein decidedly injurious to a greater or less degree. The water sometimes contains as much as 280 grains of mineral salts to the gallon (in solution); in some cases from 40 to 80 grains of soda, magnesia, and lime. It is said not to be in excess of water obtained at Omaha, in which there are 64 grains of soluble salts to the gallon, consisting largely of lime, magnesia, and but little soda. The well at Point of Rocks appears to be the purest. This incrustating quality of the water would not exist if the tubing had been carried through the whole depth of the wells, for it is probable that the alkaline quality is derived from the upper strata by solution of the salts contained therein. This fault is further apparent from the fact that in some of the wells the supply is diminishing, which would not be the case had the tubing been continued throughout, thus preventing caving in of

the sides. The cost of these wells has been no more than that of running water trains to the present time.

Artesian wells have been often proposed for irrigation purposes, but, so far as we know, have not yet been practically put to the test. We think it not at all improbable that they can be very successfully used, as suggested by the correspondent, viz.: to wash out the salts in the alkaline soils, and thus utilize them for agricultural purposes.

A flowing well furnishing 1000 gallons an hour will water a whole section of 640 acres. An artesian well is in progress at Denver which is sunk 800 feet, and water has risen nearly to the surface. The Government has appropriated $10,000 to sink a well at Fort A. D. Russell, which is now nearly 900 feet deep; as no rock has been reached, however, it is feared that it will prove a failure. The locality seems to have formerly been a deep gulf or canon filled by a flood. It has been supposed that the best locality for sinking would be in some depression; in many cases this would be true, but great care is requisite to ascertain whether the place is merely a depression in the surface soil or in the bed rock. A well 1000 feet deep costs $10,000.

C. J. M.

TESTING THE STRENGTH OF IRON AND STEEL RAILS.

In England it has been found that three hundred pounds falling fifteen feet broke an eighty pound rail. German engineers have long applied a test of one thousand pounds falling ten and one-half feet. In this country fifteen hundred pounds falling six feet is considered an extreme test. In Austria a test for steel rails has been established, of two thousand pounds falling thirteen and one-half feet, representing, it is said, about one and a half per cent. carbon. German engineers say three tenths of one per cent. is the minimum limit of carbon a steel rail should possess, otherwise the rail is too soft. In England a test was adopted of two thousand two hundred and forty pounds falling fifteen to seventeen feet on a rail resting on heavy bearings. These methods are expeditious and practical for testing the strength of rails.

To Find the Center of a Section.—Run straight lines from quarter corners to opposite and corresponding quarter corners; the intersection of these lines is the center of the section. *To this rule there is no exception;* and we trust that the time is at hand when our surveyors will all adopt it, thereby securing uniformity of practice, and eliminate *one* element of contention therefrom and one cause of reproach against the profession.

T Squares.—Those of our readers who are accustomed to the use of good instruments know of the satisfaction which arises therefrom. If those who are draughtsmen and have been using the common imported and home made T squares and triangles that are for sale, would only test the merits of one of Mr. Hahn's "own make" of these useful articles, he would certainly cry out "eureka." We have used them for several years, and would have no others in our offiec; and we believe that they are unsurpassed for excellence, beauty of finish, and cheapness, by any in the world. This latter quality will recommend them to dealers, who, we feel sure, will find it to their advantage to correspond with Mr. Hahn on the subject.

LAW AND LEGISLATION.

An abstract of decisions of the Supreme Court of the United States and of the courts of the various States in the Union upon questions relating to boundaries, surveys, etc.

1. Boundaries, fixed and established by compact between nations, become conclusive upon the subjects and citizens of those nations, and bind their rights. Poole *v.* Heegler, 11 Pet. 209.

2. The description of boundaries in a deed is to be taken most strongly against the grantor. Marshall *v.* Niles, 8 Conn. 369; Carroll *v.* Norwood, 5 Har. & J. (Md.) 163.

3. The word "between" excludes the termini. Revere *v.* Leonard, 1 Mass. 91.

4. In running out patents, a line "northward," etc., means a line due north, etc. Jackson *v.* Reeves, 3 Caines, (N. Y.) 293.

5. So the term "northerly," where there is no object mentioned to direct the inclination of the course towards the east or west. Brandt *v.* Ogden, 1 Johns, (N. Y.) 156.

6. The proprietors of adjacent lands are tenants in common of the common boundary line, and a fence erected on the line is a fixture, in which they have an undivided interest, and for the removal of which neither can maintain trespass against the other. Gibson *v.* Vaughan, 2 Bailey, (S. C.) 389.

7. A "line" in surveying and dividing grounds, means, *prima facie*, a mathematical line, without breadth; yet this theoretic idea of a line may be explained, by the facts referred to and connected with the division, to mean a wall, a ditch, a crooked fence, or a hedge—a line having breadth. Baker *v.* Talbott, 6 Monr. (Ky.) 182.

8. A course given from corner to corner is, *prima facie*, to be intended a right line; yet this may be exalained, by other matters in the case, to be a curved line. Baker *v.* Talbott, 6 Monr. (Ky.) 182. See Lyons *v.* Ross, 1 Bibb. (Ky.) 466.

9. By the use of the term "about," in describing the length of line in a deed of conveyance, it is understood that exact precision is not intended; but if the place where the monument stood, by which the distance was controlled and determined, cannot be ascertained, the grantee must be limited to the number of rods or feet given. Cutts *v.* King, 5 Greenl. (Me.) 482. See Purinton *v.* Sedgley, 4 Greenl. 286.

10. Where the boundaries mentioned in a deed of conveyance are inconsistent with each other, those are to be retained which best subserve the prevailing intention manifested on the face of the deed. Gates *v.* Lewis, 7 Verm. 511; Jackson *v.* Sprague, Paine, 494.

11. Where plats are returned, without any actual survey made, and grants made pursuant to them, the general rule of construction is, that the most material and most certain calls shall control those that are less certain and less material. Newson *v.* Pryor, 7 Wheaton, 7. See Thomri *v.* Godfrey, 3 Gill & Johns. (Md.) 142.

12. The least certainty in the description of land in deeds must yield to the greater certainty, unless the apparently conflicting descriptions can be reconciled. Benedict *v.* Geylord, 11 Conn. 335. See Massie v. Watts, 6 Cranch, 148; Cudney v. Early, 4 Paige, (N. Y.) 209.

13. A mistake in the calls of a patent may be corrected by reference to the plat and certificate of survey. The survey is a matter of record, and of equal dignity with the patent. Steele v. Taylor, 3 A. K. Marsh, (Ky.) 226.

14. The plat is a necessary part of the surveyor's report required by law, and it is therefore proper evidence in ascertaining the position of the land, and what is included, and may serve to settle the figure of a survey, and correct mistakes. Alexander v. Lively, 5 Monr. (Ky.) 160.

15. Surveys may be used to aid in supplying omissions, or in correcting mistakes in patents. Bruce v. Taylor, 2 J. J. Marsh, (Ky.) 160.

16. Where lines are laid down on a map or plan, and are referred to in a conveyance of land, the courses, distances, and other particulars appearing on such plan, are to be as much considered the true description of the land conveyed as they would be if expressly recited in the deed. Davis v. Rainsford, 17 Mass. 211. See Lunt v. Holland, 14 Mass. 149; Kennebec Purchase v. Tiffany, 1 Greenl. (Me.) 219.

ACADEMY OF SCIENCES.

The Academy of Sciences held a meeting at 263 Wabash avenue the 14th inst, at which there was a general attendance of members. Dr. H. A. Johnson occupied the chair.

Prof. De la Fontaine presented a paper giving the result of his investigations, continued through ten years, on turbium, leading him to the conclusion that it is a metal. He disagreed with Berzelius and others, who have regarded turbium as a compound. He also made some remarks on the spectroscopic examination of old blood, arriving at the conclusion that microscopic tests show no difference between old and new blood. At the next meeting he will give some illustrative examples.

Prof. Andrews made some remarks on the mirage, as seen on Lake Michigan. He said the sun and moon in rising over the lake present some singular distortions. The mirage is more distinct when a warm wind is blowing from the southeast. A peculiarity is a double horizon, the horizon of the lake varying every two hours. The inverted image is cut off by the lower horizon. He had not concluded whether the upper horizon seen was a horizon of water or rising mist, or a stratum of cold air. If the latter it was not always alone, for at times there were others still above it. Projecting through the different strata, the vapor assumed shapes like lamp-shades. The professor exhibited a diagram of a vase shape, which he had sketched from nature. He would attempt no explanation of these singular phenomena, but presented them to the Academy for consideration.

He also disputed the theory advanced by Dr. Lapham in a late article in the *Lakeside Monthly*, that Lake Michigan had formerly a lower level. He had examined but found no beach lines, and briefly explained that the appearance of a lower bed was caused by the erosive power of streams which cut out deep channels just before entering the bodies of water into which they flow.

Mr. Colbert gave the history of the discovery by Capt. Turnock, late U. S. A., of an aerolite 10 feet in diameter in the Yellowstone region. He also explained the result of some recent investigations by himself as to the mean distance of the moon from the earth, which he concluded was 238,674 miles, the parallax being 57 minutes, 0.67 seconds.

Prof. Andrews announced as a piece of scientific news the discovery of a complete skeleton of a palœotherium magnum, found in the gypsum beds at Paris, disproving the theory of Cuvier that it was in shape like the rhinoceros, as it was, on the contrary, a little and graceful animal like a deer, except that it had a swan-shaped neck. The conclusion was evident that in adducing forms from fragments, the result is not always infallible.

The meeting then adjourned.

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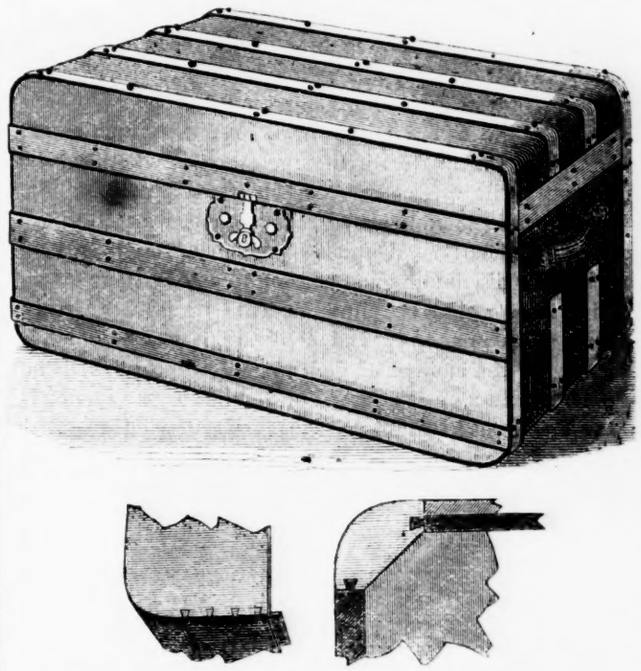
THE EVARTS TRUNK.



To a people who are so migratory in their habits as Americans, some contrivance in which they can carry their clothing and such other personal effects as may be considered necessary on a journey, becomes an absolute necessity. This necessity has produced the TRUNK which is so notable an accompaniment of American travelers, females especially, in all parts of the world. Yet notwithstanding the universal use of the TRUNK, it is to-day the same flimsy, ill-constructed wooden box that it was many years ago, and it has long been a problem with tourists how to protect their luggage against the vandalism of the baggage smashers.

This problem has been solved by H. H. Evarts, of this city, who, by means of "dovetailing" the corners together, extending the inner ends from the bottom into the lid portion of the trunk, and using tough wooden straps on the outside of the covering, has demonstrated how in this most useful article of modern life, we may secure strength without cumbrousness, and the satisfaction of feeling that our wardrobes and other effects are secured against damage.

CIVIL ENGINEERS' CLUB OF THE N. W.

The regular meeting of the Civil Engineer's Club of the Northwest was held at the Academy of Sciences, Monday evening, April 13. Members present were Messrs. Chesbrough, Morehouse, Harris, Hjortsberg, French, Bryson, Pitts, Williams, Farnham, and Wilson. Chas. J. Quetil, C. E., was admitted to membership.

Secretary Morehouse read a paper prepared by Mr. Quetil, about a novel method of constructing a suspension bridge, intended for a span of 1500 feet, with high towers, thus presenting a clear span with no piers to obstruct navigation; after which followed a discussion of the subject.

The Club then adjourned.

SOME FACTS ABOUT COAL.

BY F. E. SAWARD, EDITOR COAL TRADE JOURNAL.

Coal is so important a feature in the economy of any State or country, that a publication devoted to either of the numerous industries of our country must necessarily have its place in the commercial world. All communities are interested in the matter of the fuel supply, whether it be in regard to its use in the workshop, for propelling the steamship and the railway car, or creating warmth about the domestic hearth. Without an adequate supply of coal available for distribution and consumption, our manufacturing interests would be puny indeed. It has been truly said, that the prosperity and civilization of a country is indicated by the amount of fuel annually consumed. The amount of coal annually mined or produced for market is said to be in round numbers 230,000,000 tons, distributed as follows:

United States	46,000,000
Nova Scotia	1,051,467
Great Britain	123,386,758
France	15,000,000
Belgium	13,773,176
Austria	6,443,575
Prussia	23,316,238
Poland	112,500
Russia	517,000
Spain	593,033
India	750,000
New South Wales	919,522

The United States Census Reports for the year 1869 gives the total number of collieries as 1566. The horse power of the steam engines employed in collieries is stated to be 62,310. There is an army of 92,453 men and boys employed in this industry; the output is stated to be 32,860,690 tons; capital invested $110,008,029.

It will thus be seen that England, with but 11,900 square miles of coal area, produced upward of one-half of the entire supply. The United States, with a proven area of 192,000 square miles of coal area, produced last year about 46,000,000 tons, as follows:

Anthracite	22,828,176 tons.
Bituminous	23,645,450 tons.

Which proves that the coal interests of the United States are yet in infancy. The year 1873 was one of much excitement in England, the question of the probable exhaustion of the sources of fuel supply of that country was agitated, and as a consequence the price of this most important mineral was run up until the retail price in London reached 54 shillings per ton.

Here in America we need not fear a shortening of the supply, but the era of low prices for anthracite appears to have passed. However, we have bituminous of equal value for nearly every necessary purpose, available in such quantity as precludes any extraordinary price.

To show the growth of our manufacturing industries, it is interesting to note the coal trade of several of the principal cities. Beginning with San Francisco, Cal., a business amounting to 434,467 tons is now done at this point, having increased from 77,635 tons in 1860. More than half of this tonnage is produced on the Pacific coast, the remainder being imported mainly from Australia and England, only 30,000 tons coming from the eastern States, and consisting about equally of Cumberland and anthracite.

At Cincinnati, Ohio, in 1853, the trade only numbered 8,000,000 bushels, and for 1873 the recorded receipts were 37,000,000 bushels, the greater proportion being from Pittsburgh and vicinity.

Baltimore, Md., does a large shipping business in coal from the Cumberland region, commencing in 1842 with 1,700 tons for the year, and in 1873 it had increased to upward of 2,000,000 tons; of this, 1,800,000 tons were reshipped to the north and east. Some 350,000 tons of anthracite is received and used at this point.

Buffalo, N. Y., is fast gaining prominence as a coal shipping port. Its business in 1863 amounted to but 83,774 tons of bituminous, and 123,319 of anthracite. There was about 60,000 tons of this amount sent to the west, via the lakes. In 1873 the trade had increased to 1,137,038 tons, of which 733,929 tons was anthracite. The city consumption was estimated at 600,000 tons for that year.

Boston, Mass., received, in 1873, 1,164,373 tons, only 87,700 tons of which was foreign coal; in 1863 the figures showed a business of 180,445 tons foreign, and 589,921 tons domestic.

Chicago, in 1852, received only a total of 46,233 tons of all kinds; and in 1873 it has amounted to 1,602,005 tons. Of this, 232,165 tons were sent off to other points by rail, lake, or canal. The anthracite receipts were 538,000 tons in 1873.

Pittsburgh, Pa., in 1843, did a trade of 737,150 bushels of coal and coke, and in 1873 the total trade was 3,425,999 tons; thus showing an enormous increase in this mineral. All but 5,814 tons was bituminous.

Cleveland, Ohio, in 1865, received 465,555 tons of all kinds, and used 229,550; in 1873 the receipts were 1,599,212 tons, and the amount used at this point was stated at 744,350 tons.

London, England, uses 6,000,000 tons annually.

New York and vicinity is put at 2,000,000 tons. We imported 456,015 tons in 1873, and exported 584,633 tons.

These few facts are sufficient to show the importance of our subject.

GOOD WORDS.

ROCHESTER, MINN., April 9, 1874.

To the Editor—Dear Sir: The prospectus of THE ENGINEER AND SURVEYOR just received. It will, I trust, supply a want long and seriously felt by the profession. May abundant success attend your enterprise. Enclosed please find P. O. Order for $2 for the first volume.

THOMAS HUNTER, Engineer and Co. Surveyor.

MAGNOLIA, Harrison Co., Iowa, April 8, 1874.

GEO. H. FROST—*Dear Sir:* Enclosed I send you P. O. Order for $2, for which please send me THE ENGINEER AND SURVEYOR for one year. Hoping the paper may prove a success and meet the wants of our profession, I remain Respectfully yours, GEO. MADISON.

LANCASTER, Wis., March 8, 1874.

GEO. H. FROST—*Dear Sir:* I am pleased with your prospectus, and have long felt the need of such a publication. I shall probably subscribe. Would like to see the first number.

Yours, etc., JOEL BARBER, Surveyor.

ADVERTISEMENT.

Throughout the United States and the Dominion of Canada, there are certain places which, by their location and natural advantages, are peculiarly adapted to the development of some great manufacturing enterprise. There are mineral regions which only need to be placed in a strictly truthful position before the public to be appreciated and attract the attention of capitalists. There are great tracts of agricultural and grazing lands in the South and West which are practically unknown, but which, if properly brought to the notice of the right parties, would soon create a demand therefor, and ultimate settlement.

The frequent misrepresentation that has been indulged in with regard to the agricultural and mineral lands of this country, has occasioned distrust in the public mind, and spread to foreign lands, so that it is becoming every year more difficult to induce respectable parties to turn their attention to these important interests. We invite the attention of owners of first-class property, that may be rendered available for manufacturing, mining and agricultural purposes, to the advantages of "THE ENGINEER AND SURVEYOR" as a medium for thoroughly advertising the same. We are prepared to visit and faithfully survey, map and illustrate any such property in the United States, and we will at any time give references as to our ability to investigate and correctly report the same. Our reputation for honesty and reliability is open to inquiry, and it is our purpose to present only such information to our readers as can be strictly relied on. The work will be executed as economically and speedily as possible, and we will always guarantee that, when it is practicable, the information will be laid before the special class of readers for whom it is intended.

We invite correspondence as to terms, etc., on the subject.

Book Notices.

A Treatise on the method of Government Surveying as prescribed by the United States Congress, and Commissioner of the General Land office, with complete Mathematical, Astronomical and Practical Instructions for the use of United States Surveyors in the field, and students who contemplate engaging in the business of Public Land Surveying. By Shobal V. Clevenger, U. S. Deputy Surveyor. Published by Van Nostrand, New York.

A valuable and useful book, and one very much needed by surveyors everywhere, but must be especially useful to those who expect to be engaged in surveying Government lands. The contents are classified and arranged in four parts. Part First, after giving many valuable suggestions in the Introduction, treats of the surveying operations in the field, such as locating and marking the Initial Point, running the several Parallels and Meridians, subdividing into Townships and Sections, and Meandering, and closes with an account of some of the irregularities that the surveyor meets with in practice and how to dispose of them.

Part Second describes the method of Triangulating across streams, Traversing Meanders; devotes several pages to the Astronomy o surveying, explains the use of logarithmic and other tables, Convergency of the Meridian, the use of the Vernier, and why the Compass is the instrument best adapted to the multiform requirements of the United States survey.

The Third Part tells how to "flag" and "chain," to "blaze" in the timber, and mark corners for future identification; what topography to note, and how to keep the Field Notes of the survey; the style of "outfit" needed on a government survey, and how to distill the alkaline water of the western prairies, so as to render it available for drinking and cooking purposes.

The Fourth Part gives the Logarithms of numbers, table of convergencies, lengths of degrees of latitude and longitudes, Refractions, and Equation of Time; Logarithmic Sines, Cosines, Tangents and Cotangents, Traverse Table, Natural Tangents and Cotangents, and a price-list of Instruments.

As the title gives it and the contents show, the work is mainly for the use of United States Deputy Surveyors. But it must also be of great use as a hand book for all surveyors.

The style of binding which has been adopted makes it very convenient for the pocket, and we cannot but think it must prove to the surveyor what "Henck" is to the railroad engineer.

We take exception to the method recommended, for finding the center of the section—that of taking the middle point of the measured east and west quarter line, but we will discuss that in another place.

The book is well printed on fine paper, with gilt edges, is illustrated with numerous diagrams, and bound in flexible covers. Price, two dollars and fifty cents, for sale by D. Van Nostrand, Publisher, 23 Murray St., N. Y.

DECISIONS IN LAW.—In a preceding column will be found the first of a series of abstracts of decisions of the Supreme Court of the United States and the courts of the various States of the Union, upon questions relating to boundaries, surveys, etc. They are carefully compiled by John Dunn, Esq., of New York city. These alone are well worth, to the surveyor, the subscription price of our paper.

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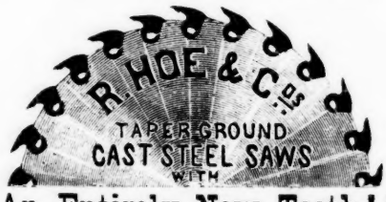

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